

Application Serial No. 10/501,842
Amendment dated March 3, 2008
Reply to Office Action dated September 4, 2007

REMARKS/ARGUMENTS

Several of the claims have been amended to place them in better form. Furthermore, a new independent Claim 22 has been added.

For the reasons set forth below, it is submitted that the claims are neither anticipated nor rendered obvious by Nakamura or Nakamura combined with a secondary reference. It is requested that the Examiner reconsider and withdraw the rejections.

At the outset, it is noted that Claim 1 is in means plus function format. Accordingly, the claim covers the corresponding structure set forth in the specification plus equivalents thereof in accordance with 35 U.S.C. § 112, paragraph 6.

In comparing Fig. 5 of Nakamura and Fig. 1 of the present application, both similarities and differences between the two are apparent. Fig. 1 of the present application shows an FSF laser comprising an acousto-optical modulator 1c. In Nakamura, an FSF laser is also provided with an acousto-optical modulator AOM wherein the AOM is excited with a signal generator connected to a PC. In the present application, the piezo element 1c₁ excites the acousto-optical modulator 1c. In the present application an Ytterbium-based fiber 1d is utilized as the amplification medium. As set forth in paragraph 36 of the published application, energy from a point laser designed as a diode laser (not shown) is irradiated into the fiber so that it can be used as an amplification medium. Correspondingly, Nakamura discloses a pump LD irradiating light into a crystal used as the gain medium. In both the present application and Nakamura energy is provided into the gain medium via a pump laser. In the present application as shown in Fig. 1, the pump laser input can be accomplished by means of a fiber coupler 1e or the pump light 1e₂ can be launched via the high-reflecting mirror 1b as indicated by the beam 1e₂.

As described so far, and as pointed out in paragraph 37 of the published application, the Nakamura FSF laser and the FSF laser shown in Fig. 1 of the present application are closely related.

The major difference between Nakamura and the present invention as defined by Claim 1 is the presence in the claimed invention of means to increase the beat intensity of the frequency components emitted. In one embodiment, a means provided to implement this is an additional fiber coupler 2a shown in Fig. 1 that is utilized to coupled injection light 2b into the fiber, the injection light being emitted from an injection laser separate from the pump laser. No such injection laser is provided by Nakamura. It should be noted that the injection

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laser of the present invention is not the pump laser pumping energy into the gain medium to cause lasing. Rather, it is an injection laser serving a different purpose. The difference between pump light simply supplying enough energy to cause inversion in the gain medium on the one hand and injection light on the other hand being emitted from a second laser which is different from the pump laser is that the injection laser is utilized to increase the beat intensity of the emitted frequency components. Without a pump laser no emission of any frequency component would occur at all so the presence of the pump laser is common to Nakamura and the present invention. However, the pump laser is not a means to further increase the beat intensity of the emitted frequency components. Nakamura does not disclose a further injection laser as presently claimed in addition to the pump laser. Furthermore, it is believed that there is no incentive provided to include such an additional injection laser.

Although Nakamura states on page 313 in the right column that

"The dynamic range of the proposed technique is 30 – 40 dB lower than that for convention OFDR. This might be attributed to the fact that the laser output consists of a number of comb components and the beat signals generated by them interfere destructively".

Nakamura states on page 309 at the right side, first paragraph, that

"... there is a phase correlation between the comb components separated by 20,000 orders. The mechanism of such a highly phase-correlated chirped frequency comb generation is not understood yet."

Nakamura uses this phase-correlation to allow for measuring over long measurement ranges. Thus, he relies on the correlation to allow for long distance measurement. One would thus expect the person skilled in the art to increase the phase correlation. High correlation means low noise.

The present application, on the other hand, suggests just the opposite. As explained in the present application the noise of a laser is causing the measurement signals. In other words, the teaching of the present application is that adding noise by injecting injection light into the FSF cavity increases the beat intensity. Increasing the beat intensity provides for a better signal to noise ratio of the measurement signal. Thus, adding noise according to the present application improves the signal to noise ratio of the beat intensity. There is no such teaching in Nakamura.

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The present invention discloses a particularly advantageous way to increase the noise in the FSF laser and thus improve the signal to noise ratio. This is done by the introduction of injection light, which is different from the pumping light of both the present application and Nakamura. Nakamura provides no incentive for an additional source of optical energy to increase the beat intensity of the emitted frequency components.

For the reasons set forth above, it is submitted that the claims patentably define over Nakamura.

With regard to the double patenting rejection, a Terminal Disclaimer is submitted herewith.

Although it is believed that the application is now in condition for allowance, if the Examiner is of the view that further issues remain, it is requested that he telephone the undersigned at 260-460-1692.

In the event Applicants have overlooked the need for an extension of time, payment of fee, or additional payment of fee, Applicants hereby petition therefor and authorize that any charges be made to Deposit Account No. 02-0385, Baker & Daniels.

Respectfully submitted,

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CERTIFICATION OF MAILING

I hereby certify that this correspondence is being deposited with the United States Postal Service as First Class Mail in an envelope addressed to: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450, on: March 3, 2008

Enc. Petition for Extension
of Time
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Terminal Disclaimer
Check No. 129035 (\$130.00)
Return Postcard

JOHN F. HOFFMAN, REG. NO. 26,280

Name of Registered Representative

Signature

March 3, 2008

Date